View metadata, citation and similar papers at core.ac.uk

brought to you by CORE

provided by NASA Technical Reports Server

Speed of CMEs and the magnetic non-potentiality of their source ARs

Sanjiv K. Tiwari

NASA Marshall Space Flight Center, ZP 13, Huntsville, AL 35812, USA

David A. Falconer, and Ronald L. Moore

NASA Marshall Space Flight Center, ZP 13, Huntsville, AL 35812, USA

Center for Space Plasma and Aeronomic Research, University of Alabama in Huntsville, Huntsville, AL 35899, USA

and

P. Venkatakrishnan

Udaipur Solar Observatory, Physical Research Laboratory, Udaipr 313001, India

Abstract

Most fast coronal mass ejections (CMEs) originate from solar active regions (ARs). Non-potentiality of ARs is expected to determine the speed and size of CMEs in the outer corona. Several other unexplored parameters might be important as well. To find out the correlation between the initial speed of CMEs and the non-potentiality of source ARs, we associated over a hundred of CMEs with source ARs via their co-produced flares. The speed of the CMEs are collected from the SOHO LASCO CME catalog. We have used vector magnetograms obtained mainly with HMI/SDO, also with Hinode (SOT/SP) when available within an hour of a CME occurence, to evaluate various magnetic non-potentiality parameters, e.g. magnetic free-energy proxies, computed magnetic free energy, twist, shear angle, signed shear angle etc. We have also included several other parameters e.g. total unsigned flux, net current, magnetic area of ARs, area of sunspots, to investigate their correlation, if any, with the initial speeds of CMEs. Our preliminary results show that the ARs with larger non-potentiality and area mostly produce fast CMEs but they can also produce slower ones. The ARs with lesser non-potentiality and area generally produce only slower CMEs, however,

there are a few exceptions. The total unsigned flux correlate with the non-potentiality parameters and area of ARs but some ARs with large unsigned flux are also found to be least non-potential. A more detailed analysis is underway.

SKT is supported by an appointment to the NASA Postdoctoral Program at the NASA Marshall Space Flight Center, administered by Oak Ridge Associated Universities through a contract with NASA. RLM is supported by funding from the Living With a Star Targeted Research and Technology Program of the Heliophysics Division of NASA's Science Mission Directorate.

sanjiv.k.tiwari@nasa.gov